CLAIMS

We claim:

1. A method of removing a liquid and vapor mixture from a plurality of spray cooling modules connected in parallel within a closed loop liquid cooling system, said plurality of spray cooling modules located within a plurality of chassis mounted to a rack, said plurality of chassis housing a plurality of heat generating electronic components, the method comprising:

using a plurality of return branches fluidly connected to said plurality of spray modules;

fluidly connecting said plurality of return branches at acute angles to a return manifold;

fluidly connecting said return manifold to a heat exchanger; and

providing the means for flexibly configuring said plurality of chassis within said rack.

2. The method of claim 1, including connecting said plurality of return branches to said return manifold through the use of a plurality of quick disconnect fittings.

3. The method of claim 1, including making said plurality of return branches from a flexible tubing material.

4. The method of claim 1, including making said return manifold from a flexible tubing material.

5. A method of removing a liquid and vapor mixture from a plurality of thermal management modules connected in parallel within a closed loop liquid cooling system, said plurality of thermal management modules located within a plurality of chassis mounted to a rack, said plurality of chassis housing a plurality of heat generating electronic components in thermal contact with said plurality of thermal management units, the method comprising:

using a plurality of primary return branches fluidly connected to said plurality of thermal management modules;

fluidly connecting said plurality of primary return branches to a plurality of secondary return branches, wherein said plurality of primary return branches join said plurality of secondary return branches at acute angles;

fluidly connecting said plurality of secondary return branches to a return manifold;

fluidly connecting said return manifold to a heat exchanger; and

providing the means for flexibly configuring said plurality of chassis within said rack.

6. The method of claim 5, including connecting said plurality of secondary return branches to said return manifold through the use of a plurality of quick disconnect fittings.

7. The method of claim 5, including making said plurality of primary return branches from a flexible tubing material.

8. The method of claim 5, including making said plurality of secondary return branches from a flexible tubing material.

9. The method of claim 5, including making said return manifold from a flexible tubing material.

10. A method of removing a liquid and vapor mixture from a plurality of thermal management modules connected in parallel within a closed loop liquid cooling system, said plurality of thermal management modules located within a plurality of chassis mounted to a rack, said plurality of chassis housing a plurality of heat generating electronic components in thermal contact with said plurality of thermal management units, the method comprising:

using a plurality of primary return branches fluidly connected to said plurality of thermal management modules;

fluidly connecting said plurality of primary return branches to a plurality of secondary return branches, wherein said plurality of primary return branches join said plurality of secondary return branches at acute angles;

fluidly connecting said plurality of secondary return branches to a return manifold, wherein said secondary return branches join said return manifold at acute angles;

fluidly connecting said return manifold to a heat exchanger; and

providing the means for flexibly configuring said plurality of chassis within said rack.

11. The method of claim 10, including connecting said plurality of secondary return branches to said return manifold through the use of a plurality of quick disconnect fittings.

12. The method of claim 10, including making said plurality of primary return branches from a flexible tubing material.

13. The method of claim 10, including making said plurality of secondary return branches from a flexible tubing material.

14. The method of claim 10, including making said return manifold from a flexible tubing material.

15. A method of removing a liquid and vapor mixture from a plurality of thermal management modules connected in parallel within a closed loop liquid cooling system, said plurality of thermal management modules located within a plurality of chassis mounted to a rack, said plurality of chassis housing a plurality of heat generating electronic components in thermal contact with said plurality of thermal management units, the method comprising:

using a plurality of return branches fluidly connected to said plurality of thermal management modules, said plurality of return branches having a plurality of return branch flow vectors;

fluidly connecting said plurality of return branches to a return manifold, said return manifold having a return manifold flow vector;

wherein said plurality return branch flow vectors have a component in the direction of said return manifold flow vector;

fluidly connecting said return manifold to a heat exchanger; and

providing the means for flexibly configuring said plurality of chassis within said rack.

16. The method of claim 15, including connecting said plurality of secondary return branches to said return manifold through the use of a plurality of quick disconnect fittings.

17. The method of claim 15, including making said plurality of primary return branches from a flexible tubing material.

18. The method of claim 15, including making said plurality of secondary return branches from a flexible tubing material.

19. The method of claim 15, including making said return manifold from a flexible tubing material.

20. A method of removing a liquid and vapor mixture from a plurality of thermal management modules connected in parallel within a closed loop liquid cooling system, said plurality of thermal management modules located within a plurality of chassis mounted to a rack, said plurality of chassis housing a plurality of heat generating electronic components in thermal contact with said plurality of thermal management units, the method comprising:

using a plurality of primary return branches fluidly connected to said plurality of thermal management modules, said plurality of primary return branches having a plurality of primary return branch flow vectors;

fluidly connecting said plurality of primary return branches to a plurality of secondary return branches, said plurality of secondary return branches having a plurality of secondary return branch flow vectors;

wherein each of said plurality of primary return branch flow vectors have a component in the direction of said plurality of secondary return branch flow vectors;

wherein said plurality of secondary return branches are fluidly connected to a return manifold having a return manifold flow vector;

wherein each of said plurality of secondary return branch flow vectors have a component in the direction of said return manifold flow vector;

fluidly connecting said return manifold to a heat exchanger; and

providing the means for flexibly configuring said plurality of chassis within said rack.

21. The method of claim 20, including connecting said plurality of secondary return branches to said return manifold through the use of a plurality of quick disconnect fittings.

22. The method of claim 20, including making said plurality of primary return branches from a flexible tubing material.

23. The method of claim 20, including making said plurality of secondary return branches from a flexible tubing material.

24. The method of claim 20, including making said return manifold from a flexible tubing material.

25. A liquid cooling system comprising:

a pump for pressurizing a supply of liquid coolant;

a supply system fluidly connected to said pump and for delivering said supply of liquid coolant to a plurality of thermal management modules contained within a plurality of electronic enclosures mounted to an equipment rack, said plurality of thermal management modules in thermal contact with a plurality of heat generating components within said plurality of electronic enclosures;

wherein said plurality of thermal management modules cool said plurality of heat generating components by transforming said supply of liquid coolant into a supply of two-phase fluid;

means for returning and minimizing fluid momentum losses of said two-phase fluid between said plurality of thermal management units and a heat exchanger;

wherein said heat exchanger transforms said supply of two-phase fluid back to said supply of liquid coolant and to said pump; and

means for providing configuration flexibility of said plurality of chassis within said rack.

26. The liquid cooling system of claim 25, wherein said supply system includes the means of minimizing pressure losses between said pump and said plurality of thermal management modules.